



Food System Risk – Assessing Fragility and Failure

**Dr Richard Friend
University of York**

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CO2 crisis in the UK

The shortage has been sparked by record energy prices, which forced two US-owned fertiliser plants in the north of England that produce 60% of the UK's carbon dioxide (CO₂) supplies [to shut down last week.](#)

CO₂ is widely used in fizzy drinks and beer as well as in the meat industry to stun animals before slaughter. It is also used to create dry ice, which keeps food fresh for storage and transport.



CO2 crisis could hit UK food stocks well before Christmas, says Iceland boss

Shortage of carbon dioxide - used in meat industry and for fizzy drinks - is result of record energy prices



Food Systems touch every aspect of human existence

“**food system**” - the constellation of activities involved in producing, processing, transporting and consuming food.



too many of the world's food systems are fragile, unexamined and vulnerable to collapse, as millions of people around the globe have experienced first-hand during the COVID-19 crisis.

When our food systems fail, the resulting disorder threatens our education, health and economy, as well as human rights, peace and security. As in so many cases, those who are already poor or marginalized are the most vulnerable.

<https://www.un.org/en/food-systems-summit/about>

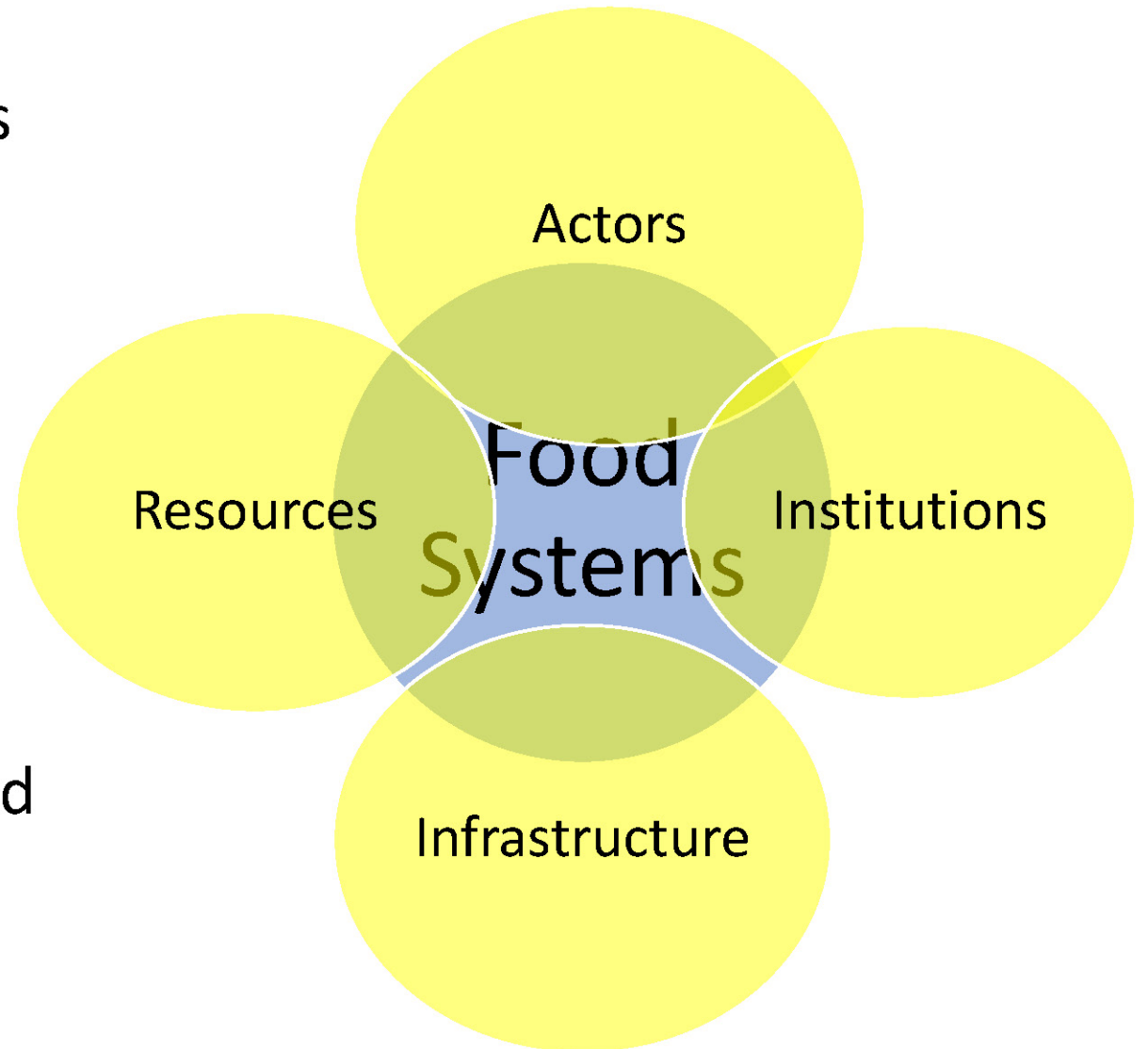
Applying a food systems approach

Actors individuals, organisations

Institutions laws, markets and policies, rules and norms

Natural Resources land, water, soil

Infrastructure roads, storage and processing facilities



Systemic risk – fragility and failure

Failure Mode Effect and Criticality Analysis

- Mapping the systems
- Identifying component elements and nodes
- What happens if one of these fails?
- What would be the consequences? How serious? For whom?
- How likely is failure? Thresholds

Safe failure > fail safe

Participatory processes

Different stakeholders have different perspectives of 'food systems'

- How food systems are structured
- Points of fragility and weakness
- What counts as critical and for whom
- Different perspectives of what is needed to reduce fragility



Resilience Characteristics

- Participatory process to score and rank
- And provide a justification for the score

Resilience Characteristics	Assessment Score					Reasons
	1	2	3	4	5	
Modularity						
Redundancy						
Diversity						
Access to Information						

Lessons Learned

- Focus on **thresholds** and **safe failure** – is intuitive
- Challenges to define systems fully – but not always necessary
- Emphasis on participatory process – may require additional input

References

Friend, R.M., Thiengburanathum, P., Harrison, L.J., Thiengburanathum, P., Doherty, B. and Thankappan, S., 2023. Participatory diagnosis of food systems fragility; perspectives from Thailand. *Frontiers in Sustainable Food Systems*, 7,

Friend R.M., Thankappan S., Doherty B. *et al.* (2019) Agricultural and food systems in the Mekong region: Drivers of transformation and pathways of change. *Emerald Open Res*, 1:12
<https://doi.org/10.12688/emeraldopenres.13104>.

Richard Friend richard.friend@york.ac.uk